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Research Article

White Storks (*Ciconia ciconia* Linnaeus, 1758) in Georgia: Current distribution and population status

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Abstract

This study provides an analysis of the current status, population trends, and distribution of White Storks (*Ciconia ciconia*) in the Republic of Georgia. Findings from our most recent survey in 2024 revealed a 40% increase in the number of White Stork nesting pairs in settlements previously surveyed during the 2018–2020 census. However, this increase was not statistically significant. The 2024 survey expanded its scope to include 36 additional settlements that had not been surveyed or reported in prior assessments, resulting in the documentation of 55 new nesting pairs within 22 settlements. Among the 23 settlements surveyed in both 2018–2020 and 2024, fluctuations in the number of White Stork nesting pairs were observed in 14 settlements, with a general increase and slight declines noted in four settlements.

Key words: Avifauna, Caucasus, Distribution, Monitoring, Threats

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Introduction

The White Stork (*Ciconia ciconia*) is one of the most easily monitored bird species due to its habitat preference close to human settlements, colonial nesting behavior, and high detectability (Kahl 1972; Bouriach et al. 2015). Given its trophic niche, this species is closely tied to wetlands, historically inhabited by humans (Kummu et al. 2011; Adams et al. 2014). White Storks favor foraging in open, wet environments with sparse vegetation, offering a diverse prey base, from large invertebrates to small vertebrates (Kosicki et al. 2006). Closeness of such wetlands to human settlements is further beneficial, providing suitable nesting sites, including rooftops and electricity pylons (Alonso et al. 1991; Janiszewski et al. 2015; Orłowski et al. 2018; Hmamouchi et al. 2020).

The White Stork is a migratory breeding species in Georgia, with a limited local range in the southern Samtskhe-Javakheti and Kvemo Kartli regions (Fig. 1), an area characterized by mountain grasslands, subalpine lakes, and wetlands that provide optimal foraging habitats for the species (Budagashvili and Javakhishvili 2024). The first nationwide census, where numbers are presented, dates back to 1984, when Abuladze and Eligulashvili (1986) documented 85 nests, of which 74 were occupied by White Storks. Subsequently, Schulz (1999) and Thomsen et al. (2013) mention 60 nesting pairs in Georgia during 1994–1995. By 2013–2014, 104 occupied nests were found (Abuladze et al.

2014), while the most recent census in 2018–2020 detected 105 nesting pairs (Shoshitashvili 2020).

Unlike many European countries, the published data about such easily monitored species is scarce in Georgia, with significant gaps between years of population censuses (Abuladze and Eligulashvili 1986; Tryjanowski et al. 2005; Kosicki 2010; Abuladze et al. 2014; Eggers et al. 2015). Given the existing threats to the population of White Storks in neighboring countries, more frequent monitoring of such habitat indicator species is crucial (Latus and Kujawa 2005; Ortaç et al. 2016; Pestka et al. 2023; Aghababyan et al. 2024). Here, we present the latest comprehensive summary of the current distribution and population status of the White Stork in Georgia.

Materials and methods

Historical data on the White Stork population in Georgia (census data for 1984, 1994-95, 2013-2014, and 2018-2020 years) were extracted from the literature (Abuladze and Eligulashvili 1986; Schulz 1999; Thomsen et al. 2013; Abuladze et al. 2014; Shoshitashvili 2020). In 2024, we conducted a new survey of White Storks, revisited all previously censused 23 settlements where breeding pairs were recorded in 2018-2020 (Shoshitashvili 2020), and expanded the census to include additional settlements within the White Stork range in Georgia (Fig. 1). In each visited settlement, we conducted systematic sampling, inspecting

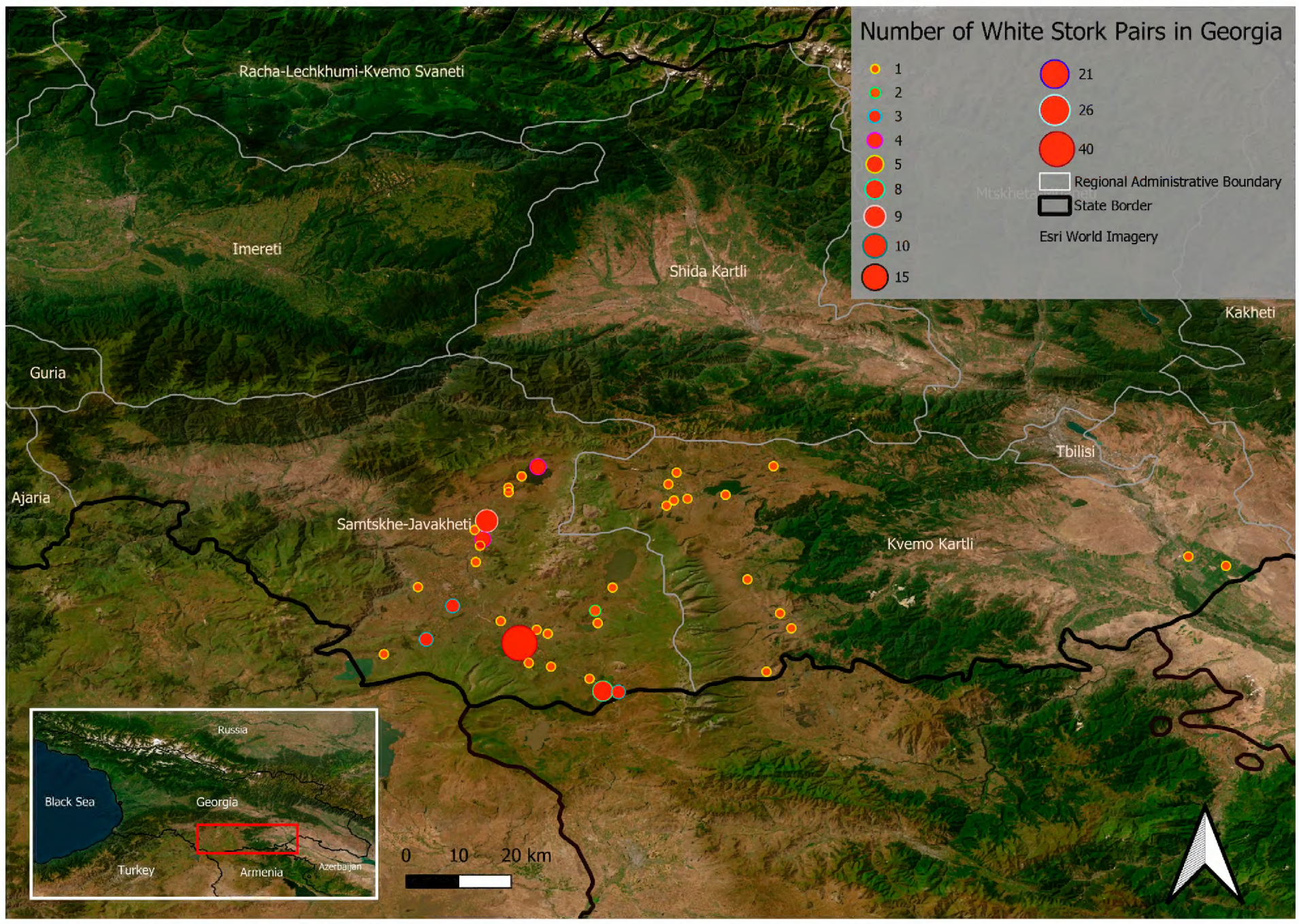

Figure 1. Distribution and abundance of the White Storks in Georgia.

every street thoroughly by car. To accurately count nestlings in active nests, we used binoculars (Zeiss Victory SF 10×42).

Descriptive statistics were used to analyze White Stork population trends over the years and to examine the distribution of nests by the number of nestlings. To determine whether there were statistically significant changes in the number of White Stork nesting pairs between 2018–2020 and 2024 from 23 settlements, we first log-transformed the count data and then applied the Wilcoxon signed-rank test to evaluate the differences between the census years.

All statistical analyses and visualization were performed in RStudio (version 2024.4.2.764) using R (R core team 2024) and the ggplot2 package (Wickham 2016). We mapped the distribution of White Stork pairs using QGIS with Esri World Imagery as the basemap.

Results

All of the nests recorded in both 2018-2020 and 2024 were located within settlements. In total, we surveyed 59 settlements, from which breeding pairs were detected in 43 (Suppl. Material 1).

During the survey, we discovered 202 nesting pairs or nests occupied by the White Stork in the study area (compared to 105 nesting pairs reported during the previous survey), indicating an upward increase in local population over time (see Fig. 2). In all the nests documented, fledglings or eggs were not vis-

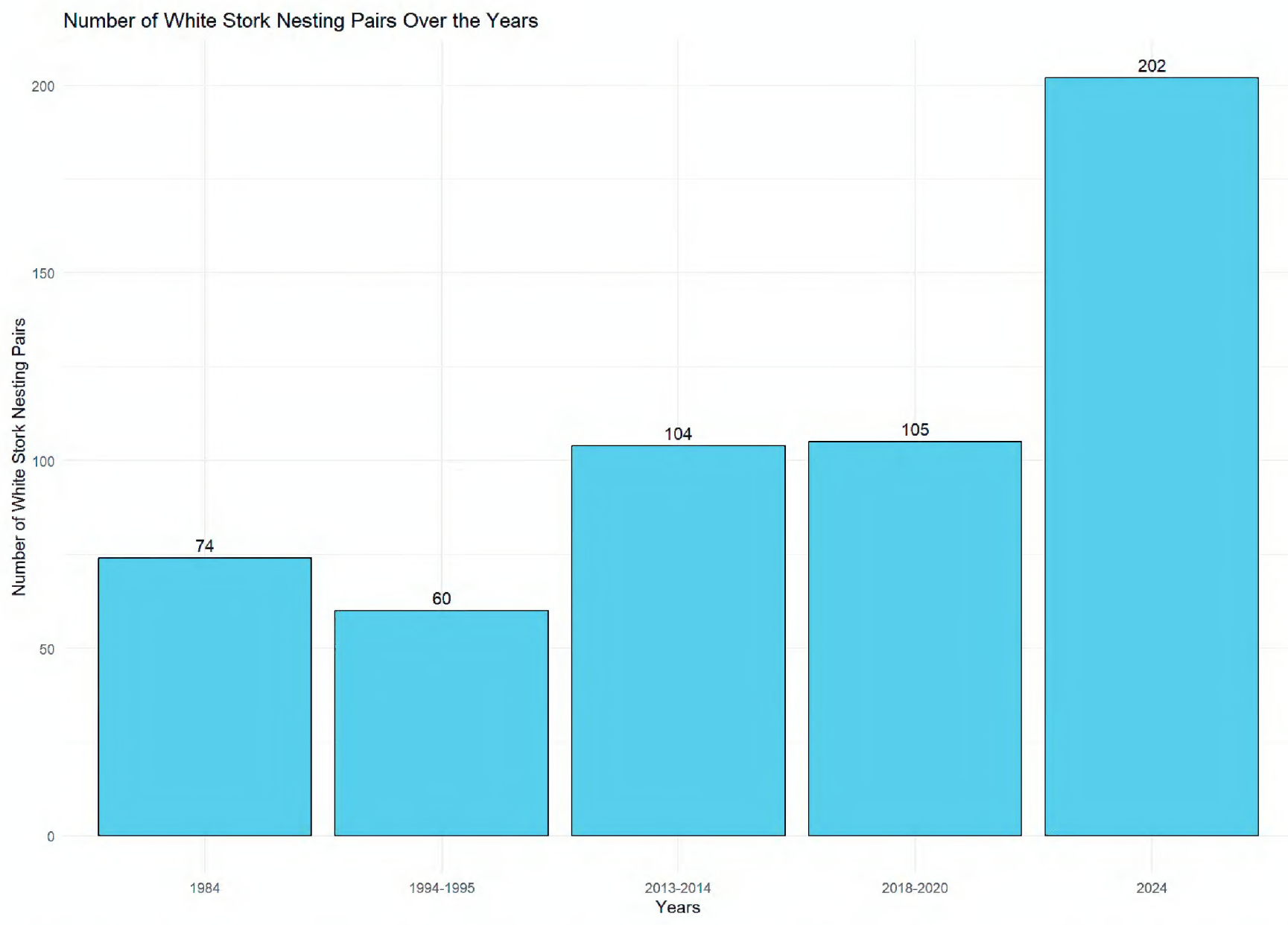

Figure 2. The graph illustrates the number of white stork nesting pairs over the years. The X axis represents years, and the Y axis shows the number of white stork pairs. The exact numbers are written on the top of each column.

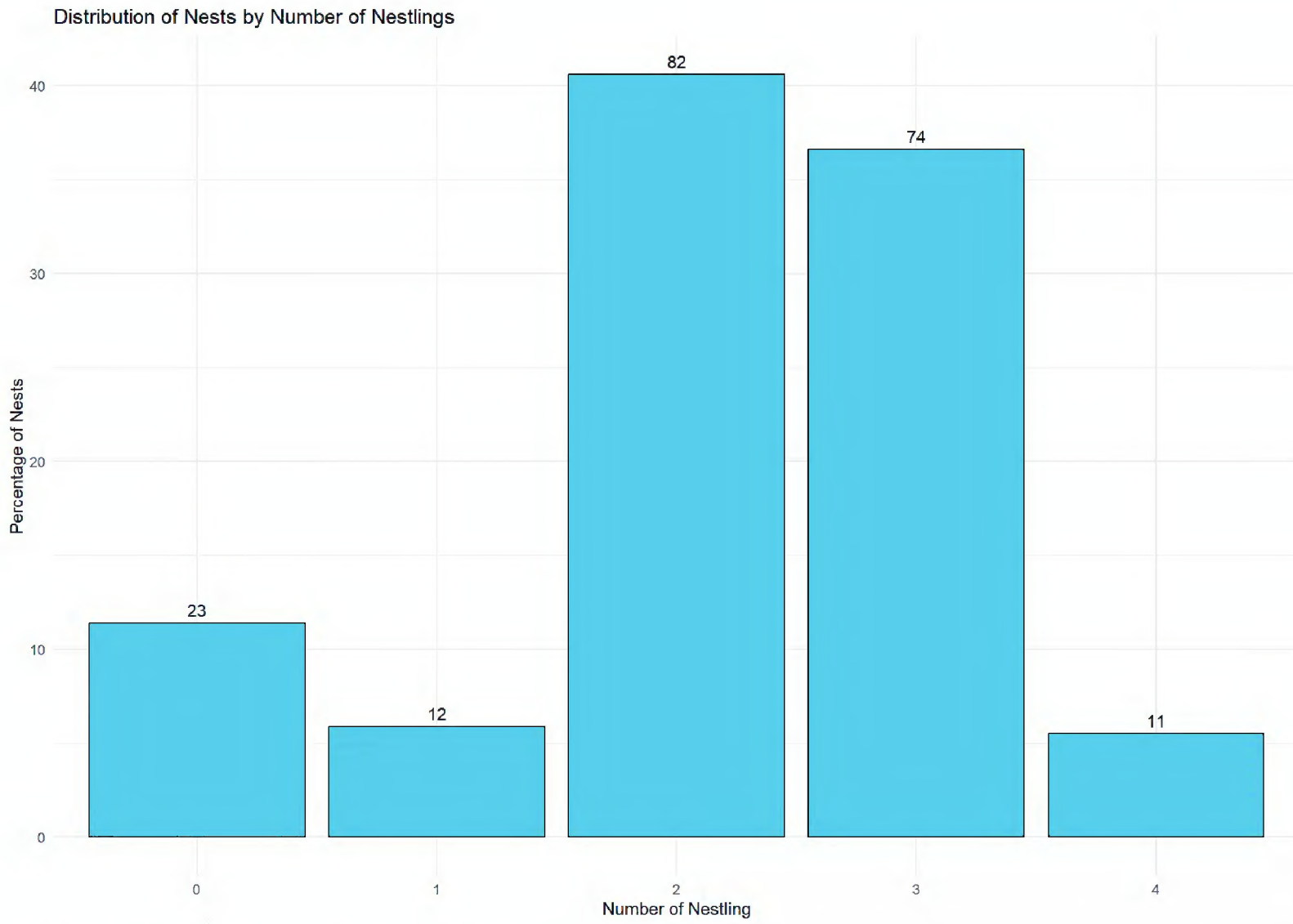

Figure 3. The histogram displays the distribution of the nests by number of nestlings for White Storks in Georgia during the 2024 census. The X–axis represents the number of nestlings. The Y–axis shows the percentage of nests. The numbers on the top of each column are the raw numbers of the nests.

ible in 11.39% (23), even if they were present. Most nests contained multiple fledglings, with 40.59% (82) having at least two nestlings and 36.63% (74) having at least three. At least one nestling was present in 5.94% (12) of the nests. The fewest nests, 5.45% (11), had four nestlings (see Fig. 3).

Between the last population monitoring in 2018–2020 and 2024, the White Stork population in Georgia increased by 40%, though this increase was not statistically significant (Wilcoxon signed-rank test with continuity correction: V = 35.5, p = 0.299). The calculation is based only on the 23 settlements that were censused during the 2018-2020 to 2024 years.

In addition, for the new settlements that were not accounted for in the 2018–2020 (or older) census-either because no nests were found or because these areas were not surveyed–we recorded breeding pairs in 22 settlements. In these 22 settlements, we recorded a total of 55 nesting pairs (see Fig. 4). Since the previous censuses (i.e., 2018-2020), there is no data on the surveyed settlements with no breeding pairs, it is not possible to check whether previously unpopulated settlements have gained nesting pairs. On the other hand, the number of nesting pairs has changed across 14 settlements during the 2018-2020 and 2024 periods. In most cases, the number of pairs increased, while in four settlements it decreased slightly (see Fig. 5). In the other 9 settlements, the number of nesting pairs did not change over the years.

Discussion

This study provided a noteworthy case of the increasing local population of White Storks in Georgia; although the observed changes were not statistical-

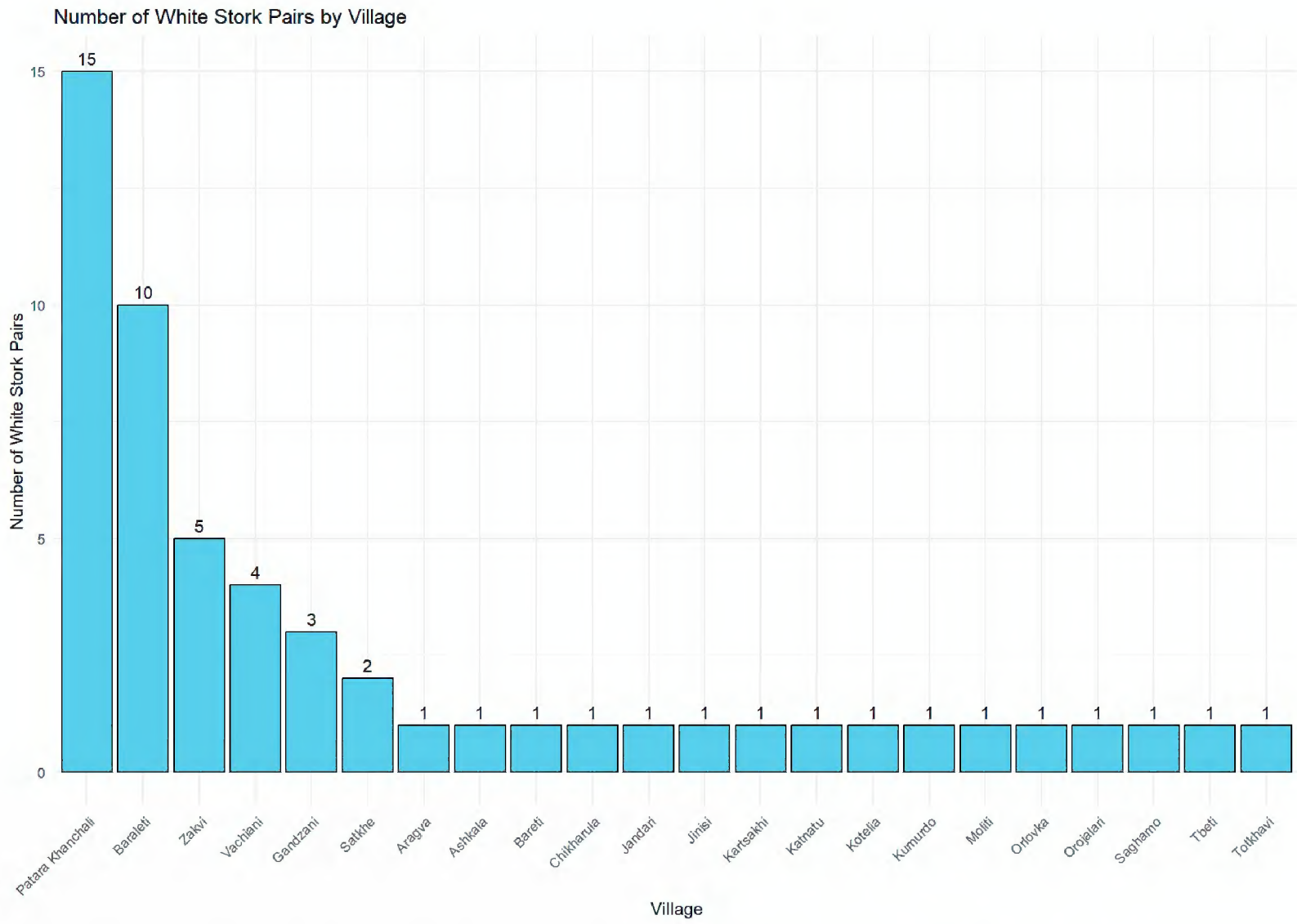

Figure 4. The figure illustrates the number of White Stork pairs by settlements in 2024. These are 22 settlements that were not surveyed during the 2018-2020 monitoring, either due to a lack of observed nests or because these areas were not visited by researchers.

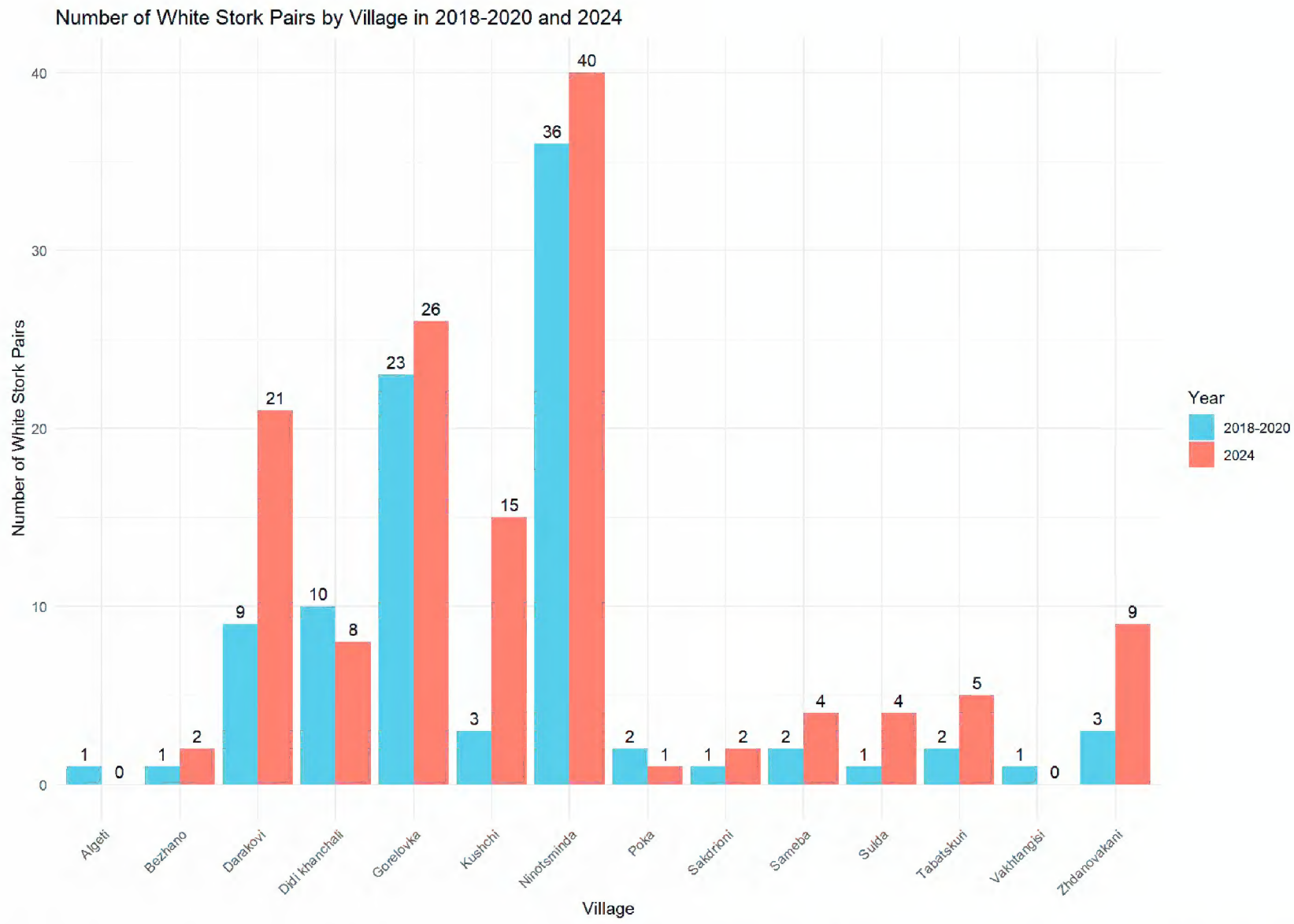

Figure 5. The figure illustrates the variation of nesting pairs across the 14 settlements. The X axis represents settlements, Y axis shows numbers of White Stork nesting pairs. Blue bars indicate 2018-2020, red bars indicate 2024.

ly significant, it indicates an existence of a stable population with increasing trends. On the other hand, several additional topics require further investigation, as the given knowledge does not allow us to unambiguously explain the observed pattern. More comprehensive studies are needed to identify the factors driving population growth. To support broader understanding of the population dynamics of White Stork in Georgia, systematic monitoring of the local population is essential, alongside the collection of data on various ecological and environmental variables. Monitoring should be conducted using consistent methodologies, and as much detailed information as possible on White Storks should be gathered. For instance, while analyzing the data, we lacked published comparative information on hatchling success from previous monitoring years.

There is also a growing commitment in Georgia to expand green energy infrastructure, including wind farms, which pose significant risks to large soaring bird species (Drewitt and Langston 2006; Marques et al. 2020). The range of potential windy areas includes the Samtskhe-Javakheti region (Global Wind Atlas 2024), which overlaps with the habitat range of White Storks in Georgia. Given the likelihood of future development in these areas, careful planning and environmental assessment are essential. Increased attention must be directed toward understanding the ecological sensitivity of this region, ensuring that any infrastructure development minimizes disturbance to the White Stork population and other vulnerable species present in the region, such as Velvet Scoters (*Melanitta fusca*), Common Pochards (*Aythya ferina*), Dalmatian Pelicans (*Pelecanus crispus*), etc. (Birdlife International 2018, 2020, 2021; Paposhvili 2018). To prevent potential population declines and mitigate conflicts between developers and conservation organizations, sensitivity mapping of the White Storks' local range is essential, which can be a strategic tool for identifying critical habitats and movement corridors that are crucial to the White Stork population in Georgia. By highlighting areas of high conservation priority, sensitivity maps will guide developers in selecting sites with minimal impact on wildlife and reduce the likelihood of collisions and habitat fragmentation (Buckley 1982). Besides, similar maps will let conservation organizations prioritize monitoring efforts, which will focus resources on high-risk areas where White Storks will be more likely to interact with potential threats. In addition, satellite tracking of the local White Stork population will provide valuable insights into their habitat use, movement patterns, migration, and potential conflicts with future green infrastructure developments in the region. The limited set of proposed research activities will be essential in developing a comprehensive database on the species while concurrently contributing to the long-term conservation of White Storks in Georgia and establishing a robust foundation for evidence-based conservation strategies.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Funding

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Author contributions

All authors have contributed equally.

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Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

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Supplementary material 1

White Storks nesting records in Georgia

Authors: Budagashvili N, Shoshitashvili D, Uguzashvili T

Data type: occurrence

Explanation note: Data table provides occurrence records of all recorded nesting pairs and nests during the census dates from 2018 to 2024 for White Storks (*Ciconia ciconia*) across Georgia.

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